3 (Sem–4/CBCS) GLG HC 3

2023

GEOLOGY

(Honours Core)

Paper : GLG–HC–4036

(Hydrogeology)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Tick the correct answer :   1×7=7

   (a) Usually the configuration of water table indicates.

      (i) loss of groundwater

      (ii) recharge of groundwater

      (iii) direction of groundwater flow

      (iv) fluctuation of groundwater

(b) Water in the phreatic zone is under

(i) atmospheric pressure

(ii) hydrostatic pressure

(iii) gravity forces

(iv) All of the above

(c) Groundwater flow map is also known as

(i) isopach map

(ii) isocontour map

(iii) potentiometric map

(iv) hydraulic map

(d) The lowering effect on the water table about the base of the well stem is called a(n)

(i) aquiclude

(ii) aartesian surface

(iii) cone of depression

(iv) speleothem

(e) A stream that receives water from groundwater is termed as

(i) affluent stream

(ii) influent stream

(iii) ephemeral stream

(iv) perennial stream

(f) Match the following :

A.	Electric log	I.	Tritium
B.	Age of groundwater	II.	Borehole diameter
C.	Caliper log	III.	Porosity of formation
D.	Neutron log	IV.	Electric resistivity

(i) A–II, B–IV, C–III, D–I

(ii) A–IV, B–I, C–II, D–III

(iii) A–III, B–I, C–IV, D–II

(iv) A–II, B–III, C–I, D–IV

(g) Which of the following instruments is used to measure evapotranspiration ?

(i) Lysimeter

(ii) Pedometer

(iii) Tensiometer

(iv) Permeameter

2. Answer the following questions : 2×4=8

(a) In an area of 1 km^2, the drop in water level is 6 m. If the porosity of the aquifer is 75% and the specific retention is 55%, estimate the specific yield of the aquifer.

(b) A confined aquifer has a source of recharge. K for the aquifer is 50 m/day. Piezometer head in two wells 1000 m apart was 55 m and 50 m from a common datum. Average thickness of the aquifer is 30 m and average width of the aquifer is 5 km. Compute the flow through the aquifer.

(c) An aquifer has 725 m thickness and the hydraulic conductivity is calculated as 2×10^{-6} m/s. What is the aquifer potentiality ?

(d) Determine the Darcy's velocity for the flow of groundwater in an aquifer between two wells 50 mts apart with a difference in their water surface elevation being 0.7 m. Hydraulic conductivity is 880 m/day.

3. Write on *any three* from the following : 5×3=15

(a) Soil water zone

(b) Well logging

(c) Hydraulic conductivity and intrinsic permeability

(d) Fluctuations in water table

(e) Effective grain size and uniformity coefficient

4. Answer *any three* of the following questions : 10×3=30

(a) State Darcy's law, its validity and its limitations. Draw a picture of a Darcy permeameter and label the variables used in Darcy's law. 5+5=10

(b) The coefficient of storage of an artesian aquifer represents the entire thickness of the aquifer, whereas the coefficient of storage of a free aquifer does not. Explain.

(c) What is chemical contamination of groundwater ? Describe briefly on the problem of fluoride contamination in groundwater giving emphasis on its distribution in Assam and related health hazards.   4+6=10

(d) What is artificial recharge of groundwater ? What are the important considerations for artificial recharge of groundwater ? Write a note on the direct methods of artificial recharge of groundwater with schematics.

2+2+6=10

(e) Describe the hydralogical cycle with schematics. Discuss about the water balance equation.   5+5=10

(f) What do you understand by the terms 'porosity', 'specific yield' and 'specific retention' of an aquifer ? Derive an expression to show the inter-relationship.

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